SCIENCE

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IN THE DIFFERENT THEORIES which have been suggested to explain the constancy in the radiation from the sun, at least during considerable time-intervals, it has been generally supposed that the temperature of the sun has not varied essentially, and in order to explain this constant temperature it has been necessary to find some source for an accession to the sun's heat. For this purpose we have the chemical theory of burning, the meteorite theory of heat being produced by the falling into the sun of vast masses of meteors, and the theory of contraction. In all these theories it is assumed that the temperature of the sun must remain constant if the amount of warmth radiated from it is to remain the same, and that, if the temperature of the sun were to sink, the amount of energy radiated must decrease. Mr. John Aitken, in a recent number of the Proceedings of the Royal Society of Edinburgh, calls attention to the fact that these premises are not absolutely necessary, since the amount of radiated energy may increase even when the temperature decreases. The facts upon which he bases this possibility are the following: 1. It is known that the power of radiation varies with the form of the material, for instance, the flame of the Bunsen burner, although of a higher temperature, radiates less warmth than that of the ordinary gas-flame; 2. As a rule, the elements radiate less warmth than compounds, and observation has established that the amount of radiation increases with the complexity of the molecular structure; 3. It is well established that at high temperatures dissociation takes place, and compounds become less complex. We see, therefore, that in the sun, on account of its high temperature, substances must exist in less complex form than on the earth, to which conclusion many of the recent deductions of Lockyer specially point. It is therefore probable that the radiating power of the material of the sun is far less than that of the earth; also that the hotter the sun, the simpler its constitution, and just so much smaller its radiating power. It is, then, no longer necessary to assume that the temperature and the amount of radiated warmth from the sun are proportional. The temperature can decrease, and at the same time, on account of the change in the chemical constitution of the sun, the amount of radiation may increase. Sir William Thomson has recently calculated the numerical data, according to the Helmholtz theory of the sun's warmth, and has found that the sun would have to contract thirty-five metres yearly in order to produce the energy which it radiates according to Pouillet's measurements. In this connection it should be said that Langley's measurements give a far larger warmth-radiation from the sun, and that they are probably too small; so that the sun would have to contract much more than thirty-five metres a year in order to produce its radiating energy through the force of gravity. But evidently energy would be produced in the sun in other ways during the cooling-off. The falling temperature, for instance, would allow of compounds being produced, which act of burning, as it were, would add to the temperature. Mr. Aitken acknowledges that his suggestions are of the nature of speculations, but he has published them in order to bring out the possibilities that the radiating power of the sun may have changed, qualitatively and quantitatively, from time to time, that its amount does not necessarily vary directly with the temperature, and that it is very doubtful whether we may apply to the material of the sun the observations on radiation which we have obtained in the laboratory.

AMONG THE 'MOVEMENTS' agitating the country is one known as the 'Old South Work.' This is not, as might be supposed, a move to stop the growth of the 'New South,' of which we hear so much, but an attempt, and a vigorous one, which started with some public-spirited ladies of Boston, with Mrs. Mary Hemenway at the head, to interest and instruct the population now living within the borders of the United States in the history of the country, especially in so far as it has an influence on present conditions. Too much time has been spent in the schools in laying before the pupils the, at this epoch, unimportant details of the early Indian wars, with the result of leaving them uninformed of later events, the effects of which have a much more immediate influence on their lives. Many believe that the American mind is empty of American history, and fear that this may lead to ignorance of those principles which have given us the success which is now our portion. But why call this movement to educate Americans in what their fathers and their grandfathers did the 'Old South Work'? It is simply that because of this ignorance, which bred indifference, the people of Boston were willing a few years ago that the Old South Church, one of the theatres for some of the most stirring acts of the Revolution, should be wiped from the face of the earth. To save the building as a reminder of the revolutionary deeds of Boston, Mrs. Hemenway gave liberally of her time and money. This was one act in striving to interest Americans in America and her history; and for some years Mrs. Hemenway was nearly alone in sustaining the 'Old South Work.' Now we are glad to chronicle that the movement has grown, and has gone West. At Chicago Mr. Edwin D. Mead has instituted a series of lectures. In Madison, Wis., a similar course has proved so popular that hundreds have been turned away each evening for lack of room. Again, in Indianapolis this instruction of Americans in what Americans have done has been found to meet such approval as to lead to similar courses in the larger towns of Indiana. We hope, that, like most 'movements' which go from the East to the West, this may prove to have the necessary staying qualities, and that the rising generation may know how the political problems they have to solve have grown from what went before.

THE GOVERNMENT EXHIBIT AT CINCINNATI.

THE National Museum, the Smithsonian Institution, the United States Geological Survey, and the Bureau of Ethnology will make a joint exhibition at the Cincinnati Centennial. Although the time for preparation has been very short, the law making the necessary appropriation not having been approved until May 28, the government scientific exhibits will be in Cincinnati in good season, and will constitute one of the most interesting features of the exposition.

In determining what to show, those in charge have been greatly embarrassed by the abundance of material from which to choose. Cases of selected objects will be taken from several departments of the National Museum, but mainly from the departments of anthropology, zoölogy, and of arts and industries. Those selected from the department of anthropology will illustrate the plan upon

which the National Museum is being arranged, by means of a number of cases showing the geographical distribution and physical characteristics of the races of men, the processes and results of some of the most primitive arts, and also by a collection illustrating the subject of biblical archæology, and a collection of remains of prehistoric man in Europe, Asia, and America. The Bureau of Ethnology will also make a display in connection with this department, choosing for its topic the pueblo of Zuñi, its arts and industries, and also an exhibition of models of Indian mounds of the Mississippi valley.

In the department of arts and industries two subjects will be illustrated. The first will be the history of trade and commerce of the United States, in connection with which will be shown a series of models exhibiting the history of water-transportation in the Ohio valley, and another series showing the history of land-transportation for three centuries, especially in connection with the migration across the Alleghany Mountains. There will also be a series of models showing the different rigs of sea-going vessels.

The other subject to be illustrated in this department is the history of the graphic arts in America. This collection is in preparation under the direction of Mr. S. R. Koehler, who has recently set up in the National Museum a collection of a similar nature. The exhibit to be sent to Cincinnati will be an extension of this series. It will consist, first, of a series of selected specimens showing each method of engraving ever practised, one group illustrating wood-engraving, another etching, another copperplate, another mezzotint, and so on. There will also be shown, as fully as possible in the space assigned, a collection illustrating the history and present condition of the art of engraving and etching in America and by American artists. There will also be shown in considerable detail the history of engraving by mechanical processes, beginning with photo-lithography, and extending through all the modern processes of photo-engraving, autotype, photogravure, etc.

The foundation of this part of the exhibit will be the magnificent historical collection presented to the Smithsonian Institution by J. W. Osborne of Washington. Other series taken from the museum collections also form the nuclei of exhibits that have been greatly extended by loans from representative American engravers and etchers.

Another collection will show the history and applications of photography in America. This was begun four years ago by Mr. Smillie, the photographer of the National Museum, and will be exhibited for the first time in Cincinnati. A collection of engraved portraits of men connected with the history of American science, which has been accumulating in the Smithsonian Institution for twenty years, will also be sent to Cincinnati. Photographs of objects in the museum too valuable or too large to be removed, a complete set of photographs of the Grant and Washington relics, and a set of photographs showing each exhibition hall and laboratory in the National Museum and Smithsonian Institution, complete the list of exhibits by these two bureaus. Many objects sent to Cincinnati in 1884, and which are therefore familiar to those who will visit the exhibition this year, have been omitted from the present contributions.

The United States Fish Commission has been assigned three thousand feet of space in the exhibition-building. The centre forty-five feet of this space will be devoted to aquaria, representing a sloping, rocky hillside with plants and trees and a rustic fence. Over the rocks will fall a cascade into a pool below, six feet nine and one-half inches long, and three feet seven inches wide. From this pool the water will be conducted by a miniature McDonald fishway into a basin twelve feet long and six feet wide. The pools will be filled with fish, and water-plants will grow about the edges. The aquaria, thirty-eight in number, will be constructed in two rows in the rocks in the rear of the waterfall. They will contain specimens of all the *Salmonidæ* available, the brook-trout, the rainbow-trout, the Loch Leven trout, the lake-trout, and land-locked salmon, besides specimens of the principal species of food-fishes of the Ohio valley and Lake region, and carp and goldfish. These aquaria will be in charge of Mr. W. P. Seal, and the entire Fishery Commission exhibit will be managed by Capt. J. W. Collins.

In the remaining space will be shown the apparatus used in scientific investigation by the officers of the Fish Commission, — an outfit for deep-sea dredging and exploration, etc.; a collection of implements and pictures illustrating fish culture and distribution; a series of casts and other representative specimens of fishes, mollusks, and marine invertebrates that are sought for food, to illustrate the objects of the fisheries.

In a separate department the story of the fisheries will be told, mainly by an extensive collection of large photographs and crayon drawings illustrating the methods employed in the fisheries, the boats and apparatus used, and even the manner and condition of life of those engaged in the fisheries. Among other interesting objects to be shown will be four large maps illustrating the distribution of the principal food-fishes, and fish used for bait in the Atlantic from Cape Hatteras to Labrador; a statistical map showing the yield of the fisheries of the country; a map showing in a graphic manner the work done in shad-propagation on the Atlantic coast, and one showing the increase in the catch of shad from 1880 to 1888.

MANNERS AND MEALS.

IN a paper by Garrick Mallery, on manners and meals, published in the July *American Anthropologist*, the author makes no attempt to exhume ancient customs from the ruins of the past, nor to describe those found in the low strata of culture represented by savage and barbaric peoples, which also explain details of our own prehistoric past. The line of thought deals rather with the customs of our own daily life in civilization. Its object is to notice those which show instructive peculiarities, and to ascertain their cause or occasion and their origin, in which attempt antiquarian research and ethnic parallel must be invoked for aid, though approached in a manner rather the converse of the usual anthropologic discussions.

It is perhaps not too much to say that a dinner-party thoroughly good in *ménu*, cookery, service, æsthetic appliances of sheen and color, culinary chemistry, the conquest over nature shown in condiments from every clime, roses in winter, and in summer ice, and last, though by no means least, in the guests with educated palates, affords altogether the strongest every-day evidence of high civilization. Brutes feed. The best barbarian only eats. Only the cultured man can dine. Dinner is no longer a meal, but an institution. An eminent jurist pronounced that the whole result and aim of the institutions and laws of England was to get twelve men in a box. It would hardly be a parody to contend that the most obvious result of our modern æsthetic and industrial triumphs is to get twelve legs under a table. Few will now assert that asceticism is intellectual. It is now truly regarded as a reversion to the plane of savages; and this is made more clear by the fact, that, when asceticism as regards food prevailed, it was accompanied with filth, and even want of decency in clothing.

A large part of the important work of the civilized world is accomplished or regulated at social dinners. Theodore Hook was reproached for bringing so many dinner details into his novels, and he defended himself with the assertion that the dinner was the great theatre of London life. Our fellow-citizens, some decades ago, were foolish enough to procure the recall of Reverdy Johnson as minister to the Court of St. James on the ground that he was spending all his time at dinners, but it was at them that he was successfully prosecuting his work. In Washington, not only diplomatic but many legislative and official transactions are arranged at dinners. This is in contrast with savage and barbaric life. Feasts were then the means of bringing people together; but the deliberations were before or after, and even ordinary conversation was unknown at the feeds. This perhaps is more strictly true among peoples who did not use alcoholic intoxicants as beverages; for the ancient Persians had a rule to vote in council twice, once sober and once drunk, so as to observe the mooted question from two points of view.

Anciently (and still in the lower stages of culture) no regular hours for meals were observed. Savages eat when they can get food, and continue to eat so long as the food lasts. The history of civilization may be traced in the changing hours of refection. Confining the examination to Europe since the middle ages, the maxim in the reign of Francis I. of France was "to rise at 5, dine at 9,

sup at 5, and couch at 9." Under Henry IV. the court dined at 11, and noon was the rule in the early years of Louis XIV., though in the provinces distant from Paris the dinner-hour remained at 9. In the household ordinances of Henry VIII. of England, the dinner was established at 10, and the supper at 4. This arrangement seems to have been then old, as Froissart mentions waiting on the Duke of Lancaster at 5 in the afternoon, "after he had supped." The differentiated meal, breakfast, with a special character of food, such as we now know it, is of very recent date. A posset or some other confection to stay the stomach was taken on rising without approach to a table, and even now Parisians habitually have their *café au lait* with a trifle of solid food in their bed-chambers, and wait several hours after rising before partaking of what they call, as distinct from *goûter*, the *déjeuner*, a meal often answering in composition to the old dinner of mid-day. A substantive change even with them is the hour of the latter meal, which is late in the evening, or in the night, instead of early in the afternoon, as it was a few generations ago.

The position of the participants at any formal repast has been attended by intricate punctilios, as much probably among savages as in the most ceremonial courts of Europe. Whether the host should be on the right or left of the door of the wigwam or tepee is a traditional ordinance, and the order in which the calumet should be passed is strictly regulated. The most modern and most judicious arrangement of the guests at a dinner-party disregards their social or official importance, and seats them with reference to their personal peculiarities, tastes, and mutual adaptation. Nevertheless, there still remains a relic of former ceremonials in the apparent necessity for the host and hostess to take into dinner and place at their respective right hands the most distinguished two of opposite sex among their guests. But, apart from this distinction, the diagram of seats is arranged to promote agreeable conversation; which object, as before remarked, is entirely ignored in savage and barbarian repasts.

The question as to who is to be served first is one about which much has been written by professors of etiquette. It seems now to be decided that on occasions where the entertainment is given for the special honor of a particular guest, or where any one of the guests towers above the others in point of dignity, such guest should be first served; but until quite recently it was obligatory for the host or hostess, or both, if both were present, not only to be first served, but actually to eat before any of their guests. This custom originated in the attempt to guard against poisoning, which was common, though apprehended more frequently than was warranted, during the middle ages. It is not traced to primitive man. On the contrary, the general rule seems to have been that the giver of a feast did not eat or drink at all, but waited upon the guests, and that practice is found still existing in many parts of the world.

The posture of the several nations or peoples when at meals has been discussed, without much result save to mark its connection with the invention of furniture and utensils. Savages who squatted or sprawled at other times, squatted or sprawled then. So luxurious nations, or their wealthy members, who habitually reclined on couches, did so at feasts.

A modern company being assembled and seated, the preliminary of grace or form for an address to the Deity or superior powers demands attention. Reference to antiquity and to the practices of uncivilized tribes shows that this almost universal form by no means originated with Christianity. It was a sacrifice to and placation of the gods. Sometimes the whole of the viands were formally offered to them; and nearly always a portion, symbolical of the whole, was actually disposed of by burning or burying in or pouring upon the earth. The early Christian Church, adopting this Pagan ceremonial with many others, gave it in time a new and far more elevated sentiment. Instead of the formula of fear, it became that of gratitude to the giver of nourishment and continued life. It is instructive to inquire into the reason why the ceremony of pronouncing grace either before or after meals has of late years so decidedly fallen into disuse. This change undoubtedly preceded the present agnostic disregard of religious services in general, and seems not to have been connected with it, but to have been induced by special influences. Religious writers have conscientiously argued that the time when a man was hungry and in sight of the food which occupied his attention was not appropriate to prayer. Others claimed that the end of the meal, when the mind was made sluggish by feeding, was also inappropriate. The perficient objection was probably the inconvenience to the service of the repast. At all events, few subjects were more prolific of jests, squibs, and derisive anecdotes during the last century than that of asking grace. Perhaps this ridicule has had effect upon its disuse.

The duty of the entertainer among us is to subordinate his own dinner to attention to the perfect service of his guests. Among the northern Algonkins and Iroquois, he had another function. He must not eat, and no one talked, but his special duty was to sing. In some Chinese circles the entertainer goes out of the banquet-room, and leaves his guests to unobserved revelry. Davy Crockett would have approved of this, as he declared that the politest man he ever saw was the Philadelphian who handed him the decanter of whiskey and then looked out of the window.

It is laid down in some books of etiquette that upon the conclusion of each course, in order that the servant may be aware that the time has arrived for a change, the guest shall lay his knife and fork parallel to each other upon his plate, but it is also observed that it is extremely vulgar to place these instruments crosswise upon the plate. There is a tradition in reference to the crosswise arrangement, that it accompanied a religious formula of blessing the pabulum which had then been consumed and was relegated to the digestive apparatus. In this connection it may be noted, that, before the fork was common, the Guelphs or imperials placed their knives and spoons longwise, and the Ghibellines or papal faction placed theirs crosswise, on the table. This practice of subsequent blessing has gone into desuetude with even more generality than has that of invoking preliminary grace. Becoming rejected, persons who used the sign connected with it showed themselves behind the times; *videlicet*, low-bred or vulgar.

In all repasts of uncivilized peoples it is remarkable that certain kinds or parts of food were refused by particular individuals, or avoided by the whole body of feeders.

At this time and in this country, but two relics of these superstitions would probably be met. One might occur on any day in case a strict Israelite were present; and another, relating to the days of the week and seasons of the year, would be apparent in the abstinence of other religionists.

The explanation once offered, that the Mosaic prohibition of certain animals, especially the hog, as food, was founded in profound hygienic wisdom, is not now considered satisfactory. Pork in good condition is recognized to be as healthful food as other meats in the same condition throughout the world, and it is now eaten with the same immunity in Syria as in Ohio. The modern Israelites offer most interesting notes to the ethnologist by their continued preservation, in the midst of a high civilization, of the religious taboo of savagery. This rite has had paramount influence beyond that of their written doctrines, in their segregation from the nations in which they have sojourned; and, now that it is becoming less strictly observed, there are evidences of their ceasing to be a peculiar people.

The refusal, at certain times and seasons, of food that in itself is hygienically good and palatable, in placation of a deity, or, without further explanation, to avoid bad luck, is well known among the lower tribes of men. Fasting may be either *jejunium*, in which all kinds of food and drink are prohibited, or *abstinentia* in relation to specified articles.

The origin of fasting is probably to be found in physiological considerations. There is a marked loss of appetite in the reflex result of grief, fear, and other strong emotions, from which noticed fact abstinence may become the conventional symbol and sometimes pretence of those emotions, and afterwards a formal act of homage to their inspiring cause. Certain it is that the practice has been found in all times and in every race of man, and therefore has no necessary connection with Christianity.

A similar explanation, *pro tanto*, attends the substitution of fish for other meats; but this topic has some peculiar features. In the early riparian populations the arrival from the mysterious depths of waters of the shoals of fish, on which they depended, was, and still is among savages, always signalized by religious ceremonies. In the same connection may be noted the rites of our plains Indians

in imploring and celebrating the coming of the less mysterious herds of buffalo. The wonderous fecundity of the fish early made it the symbol of life and the creative power. The Israelites often relapsed into the worship of the fish-gods of Phœnicia. In the early Christian Church the fish symbol for Christ, adoption of which was probably influenced by the traditional sentiment indicated, anteceded the acrostic of his name and titles in Greek, Ιησοῦς Χριστός Θεοῦ Υἱός Σωτήρ, presented by the letters of the Greek word ΙΧΘΥΣ, though the permanence of the symbol was doubtless enchanced by the literary coincidence.

The old doctrine of 'signatures,' so called, had its effect in the adoption of fish as spiritual food. It was cold, and the meat was generally white, thus coinciding with the symbolism of temperature and color to express purity.

It is fortunate that some rules in relation to repletion are no longer observed. One which was noticed among the Hurons and the Canadian Algonkins by the early French missionaries, and styled *le festin à manger tout*, consisted in the religious obligation, sometimes attended with loss of life, of the communicants to eat up every particle which was set before them. A festival, somewhat of the same nature, was called the 'glutton mass,' celebrated in England during if not after the reign of Henry IV. A less dangerous, because regulated, term of repletion was prevalent in India, according to a Brahman tradition, in which the invitees, before commencing the carouse, bound themselves around the abdomen with a band of straw; and their modified feat was, not to eat indefinitely until all had been devoured, but only until the straw bands should burst. There is no survival of this custom except in the exaggerated hospitality, generally rustic, in whch the host persists in petitions that the guests should continue to eat, without reference to their apparent wishes. Modern etiquette shows marked improvement in never suggesting either selection or quantity of provender.

The conclusion of our dinner raises again the vexed question concerning the retirement of the lady *convives* to leave the men alone. Of course, it is well understood that the object among the hard-drinking Englishmen of the last generation was to permit their sitting for the excessive consumption of wine without the disturbing restraint of the sex. The French, being less addicted to intoxication, and perhaps more professedly attached to the presence of the fair, did not admit this usage. It, however, is a partial survival of the ancient practice, still observed in most savage tribes, in which the women never eat in company with the men. A relic of this is found in the order of Bishop Grosseteste in 1450: "Streytly forbede ye that no wyfe [that is, woman] be at your mete." In this country, and indeed now in civilized Europe, there is less addiction to heavy drinking, with a greater desire for smoking after repletion: so a convenient compromise has been effected by which the gentlemen adjourn to a smoking-room, while the ladies segregate themselves for gossip.

It is well to have an agreement as to who is to take the lead in departure, by which the party is broken up. A difficulty of this kind occurred when Dom Pedro, Emperor of Brazil, was a few years ago invited to an entertainment at the White House in Washington. At a late hour, when some of the guests, becoming weary, were about to take their leave of the President's wife, she remonstrated, saying correctly that it was the etiquette for the crowned head to depart first, and all others must await his pleasure. Now, the Emperor had asked the question about our etiquette in this regard of an honest Senator, who was confused about the 'receiving party' being always composed of the persons of greatest dignity, and pronounced that Pedro must stay until all not of the household had departed. It was not till about 3 o'clock in the morning that the dead-lock was broken by the illness, real or pretended, of one of the worn-out ladies.

Another disease has been classed among the germ diseases. Dr. Arthur Nicolaier of Göttingen states it as his belief that tetanus, whether in man or beast, is the result of a micro-organism of the rod form, whose spores are widely scattered over the earth. This microbe favors the production of poisons in the system into which it is introduced, which act similarly to strychnine.

SCIENTIFIC NEWS IN WASHINGTON.

How the Washington Scientific Societies were founded; the Old Scientific Club; the Philosophical, Anthropological, Biological, Chemical, and Geographic Societies; the Cosmos Club; the Proposed Publication of Quarterlies. — Micmac Pictographs; Colonel Mallery's Investigations Last Year. — The New Naval Observatory Building to be erected at once.

The Washington Scientific Societies.

A few years ago the Scientific Club was the only organization of that character in Washington. It met fortnightly at the houses of its members, listened to the reading of papers, and closed with a collation. It had many very interesting meetings, at which important papers were read; but the zeal of its members was not as great as its organizers had hoped for. The reason for this seemed to be, that, nearly all the scientific men in Washington being specialists, they were greatly interested only in those lines of inquiry in which they were themselves engaged, and in such others as were directly or remotely related to them. But the papers at any given meeting of the Scientific Club might interest only a very few of those who were present. There was no way to fit the subjects to the audience, or *vice versa*, where both were so diversified. It was therefore thought best to have specialized societies instead of one general one, and a beginning was made by the organization of the Philosophical Society. It met fortnightly, as the Scientific Club had done, but in a hall instead of at a private residence, and the collation was omitted. The meetings were well attended, the entire time was occupied with valuable and interesting papers, and the zeal of the members grew instead of diminishing. The Philosophical Society in due time carried the idea of specialization a step farther, and organized a mathematical section, at whose meetings papers upon pure and the more abstruse mathematics and its applications were presented instead of in the meetings of the full society. There is no lack of material for the fortnightly meetings of this section, or of interest on the part of its members.

The next of the Washington scientific societies to be organized was the Anthropological. The almost exhaustless amount of valuable archæological remains that were being discovered and collected for preservation, the successful work of the Bureau of Ethnology, and the labor of classifying, arranging, and discussing the collections, caused the employment of a great number of scientific men in different branches of Anthropology, and they formed a society for the discussion of these topics. It has been as successful as its less specialized predecessor, the Philosophical Society. There is never any lack of interest, or any difficulty in securing sufficient papers to fill up in their reading the full two hours that the society is in session on every alternate Wednesday evening during the season.

For like reasons, and attended with an equal measure of success, the Biological Society, the Chemical Society, and the Geographic Society have been organized. The last-named, although the youngest, already has more than two hundred members, and all of its meetings during the past season have been successful ones. Mr. Gardiner G. Hubbard is the president of it.

When the Philosophical Society was formed, the social element, which had been one of the attractive features of the old Washington Scientific Club, disappeared. The meetings being held in a hall instead of in private residences, and the entire time of the meetings being occupied with the reading of papers, the members found that they had very little opportunity to become acquainted with each other; and so, in order that the social advantages might not be lost, the Cosmos Club was formed. It began in a modest way, taking rooms in an upper story of the Corcoran Building, and furnishing them comfortably and tastefully, but not expensively. There were reading, writing, smoking, billiard, and card rooms; the first supplied with the leading daily and weekly papers of this country, and with the principal magazines and periodical scientific publications of the United States and Europe. The initiation fees and annual dues were moderate, and the Cosmos Club flourished from the beginning. It is now established in its own house in one of the most central and beautiful locations in Washington, and is the resort of the scientific men in Washington. Once a month, during the winter, a loan exhibition of paintings, objects illustrating

some branch of science, fine scientific instruments, curios or bric-a-brac, is prepared in the club-house. Some of those of the past season have been exceedingly interesting and instructive. The privileges of the club are extended to all scientific and literary men from a distance who visit Washington; and one meets there during the season, besides the members, scores of people one likes to know.

Two or three years ago the Cosmos Club extended its house by adding a fine assembly-hall, and in this the several scientific societies hold their meetings without expense for rent, etc. Although this hall communicates directly with the club apartments, and, when not occupied by one of the societies, is used as a reading-room, it has an independent entrance from the street.

The Washington scientific societies have, until the past season, published nothing but their proceedings, including the briefest abstracts of the papers presented; but last fall the Anthropological Society began the issue of a quarterly, in which have appeared some of the most important papers read before the society, printed in full. The Biological and Chemical Societies have concluded to begin similar publications next season, and the others will probably follow their examples at an early date. The entire scientific community in Washington has been interested in the abstracts of the more important papers read in the meetings of these societies, that have appeared in *Science* during the past few months.

The three older societies established two years ago the free courses of popular scientific lectures that are given in the auditorium of the National Museum on Saturday afternoons during the winter and spring. They have been successful and thronged from the beginning, and were noticed editorially in *Science* recently.

The coming decade is to be the seed-time of science in Washington. The material for study comes pouring into the scientific bureaus like a flood, more rapidly than it can be handled. Congress is disposed to be liberal in granting money for this work, having confidence that it is wisely and economically done. In certain branches there is far better and more abundant material for study than elsewhere in the country, — as good, indeed, as there is in the world, — and the Washington scientific societies promise to do their full share in giving to the world some knowledge of our scientific treasures and what they teach.

Micmac Pictographs.

In introducing the narrative of his investigations in Nova Scotia, and afterwards in Maine, last year, Col. Garrick Mallery, of the Bureau of Ethnology, says that he does so with the more satisfaction because he is alone in that field. No one before him has examined or discussed the pictographs of the Micmacs or Abaki, or indeed published any allusion to them, except in some incidental and unappreciative manner.

"The Micmacs," he says, "were an important tribe, occupying all of Nova Scotia, Cape Breton Island, Prince Edward's Island, the northern part of New Brunswick and the adjacent part of the Province of Quebec, and ranging over a great part of Newfoundland. . . . In 1611 the Micmacs were estimated at 3,000 to 3,500. In 1760 they were reported at nearly 3,000, but had lately been much wasted by sickness. In 1766 they were again placed at 3,500; in 1880 they were officially reported at 3,892; and in 1884 they numbered 4,037. Of these, 2,197 were in Nova Scotia, 933 in New Brunswick, 615 in Quebec, and 292 on Prince Edward's Island."

After quoting from the writings of missionaries and others references to the picture-writings of the Micmacs, and giving accounts of several attempts to reduce these to a system, and even to print books in them, Colonel Mallery continues: "So far, my examination of the Micmac hieroglyphs shows that the best mode of interpreting the aboriginal characters involved in them is by the sign-language. This does not now prevail as a matter of general use among the Micmacs; but stories and traces of it survive, and the gestures of other members of the Algonkin family can be applied. Quite a number of the Micmacs remember the use of marks or devices on birch-bark in their common details of life, such as notices of departure, and warning of danger.

"My search for petroglyphs, or rock-carvings, in the land of the Micmacs, or, as the railroad-guides now call it in honor of Longfellow, the land of Evangeline, was unsuccessful, except in one notable instance. Nevertheless I am confident, from ascertained traditions, that there are more to be found. Much of the territory is yet unexplored, and the inhabitants are wholly neglectful of such subjects. The nearest neighbor, a middle-aged farmer who has lived all his life at the same spot, about three miles from the unique and probably most important pictured rocks to be described, had but a vague knowledge of them, and had some trouble in piloting me through them. These rocks are on the margin of a lake which is almost on the boundary-line between Annapolis and Queen's Counties.

"The proper literation of the name of the lake called 'Cegemacaga' in More's 'History of Queen's County, N.S.,' according to Dr. Silas Rand's work, 'First Reading-Book in Micmac Language, comprising Indian Names of Places,' is 'Kejimkoojik,' translated as 'swelled parts,' doubtless referring to the expansion of the Liverpool River, which forms the lake.

"The Fairy Rocks, as distinct from others, are three in number, on the east side of Kejemkoojik Lake, on the south of the entrance of Fairy Lake, the northernmost of the three rocks being immediately at the entrance. The westernmost and central one of the rocks, saving a small surface, at high water, and at the highest water, are entirely submerged.

"Three other rocks are about two miles south of the above, at Piel's Point (a corruption of 'Pierre's Point'), opposite an island called Glode's or Gload Island, probably named from a well-known Micmac family. These are virtually a continuation of the same formation, with a depression between them. All of these rocks are of schistose slate, Silurian formation, and with so gentle a dip that their magnitude varies greatly in accordance with the height of the water. On Aug. 27, 1887, when, according to the reports of the residents, water was at one foot above the average summer level, the unsubmerged portion of the central rock then surrounded by water was an irregular oval, the dimensions of which were forty-seven by sixty feet. The highest points of the Fairy Rocks at that date were not more than three, and few were more than two, feet above the surface of the water. The inclination near the surface is so small that a falling of the water of one foot would probably double the size of that extent of the surface which by its smoothness and softness was fit to be marked upon by scratching. The inclination at Pierre's Point is steeper, but still allows a great variation of exposed surface in the manner mentioned.

"Mr. George Creed of South Rawden, who, I believe, is the only intelligent man in the peninsula who ever visited Fairy Rocks before me, did so in July, 1881, and accompanied me last year. His attention was entirely directed to the northernmost one, which was then much more exposed above the water than in September, 1887, and much of the inscribed portion seen by him in 1881 was under water in 1887. That the parts of the rocks adjoining those exposed are inscribed, is evident, as the inscriptions were seen in 1881 by Mr. Creed through the water, and again through a water-glass in 1887. His recollection of the inscribed dates seen in 1881 is that a number were of the last century, and some with French names attached were earlier than 1700, the worn appearance of which justified the correctness of the date. A number of markings were noticed by him which are not found in the parts now exposed, notably among which were fishes and whales. There were also wigwams and native animals, evidently of more ancient marking than the etchings of horses, ships, houses, and other European objects which are more frequent on the constantly exposed surface. A noticeable point was that the large surface where the rock was smooth was completely marked over, no space of three inches square being unmarked; and over nearly all the surface there were two, and in many cases three, sets of markings, above one another, recognizable by their differing distinctness. It also seemed that the second or third marking was placed upon localities where the earlier markings have been nearly smoothed out or obliterated: therefore the antiquity of the earliest must be considerable. With pains and skill the earliest markings can be traced, and these are outlines from which intrinsic evidence is obtained that they were Indian; whereas the later and more sharply marked outlines are obviously made by civilized men or boys, the latest being mere initials or full names of persons, with dates attached.

"I saw dates on the part exposed from 1800 to the current year, the number of last year being much the greatest over the favorable surfaces for marking; and, when these were found, the double or treble use in some instances was noticed.

"After having actually gotten on to the rocks, and discovered what they were and how to distinguish and copy them, it appeared, that with the exception of a very few characters recently dug or chipped out by lumbermen or visitors, almost always initials, the only interesting or ancient portions were scratchings, which could be made by any sharp instrument on soft and polished slate. The rocks were great drawing-slates, affording a temptation to any idly disposed person to scratch. Happening to have with me an Indian stone arrow which had been picked up in the neighborhood, I used that upon the surface, and it would make as good scratches as any upon the rocks, except the very latest, which were evidently cut with metal knives by the whites. The time in which I was actually at work in taking copies was very short, only parts of two days; and then a violent storm arose, which continued for several days, during which time it was impossible not only to see the faint scratchings which were of interest, but even to move over the rocks, as they were rendered as slippery as glass by the moisture; and then I was forced to leave for Washington.

"The mode in which I took the copies was by running over and through their outlines with a blue aniline pencil, and then pressing a wetted sheet of linen or paper upon them, so that the impression was taken as by print. Purposely, in order to experiment upon a successful mode of getting the copies, I made my first work upon those that were of least apparent interest, *experimentum in corpore vili*, so that I should not by my operations spoil those which were of more importance. The main object which I had in the examination of the inscriptions was to ascertain whether there were upon these rocks any of the more simple and more probably aboriginal characters that are found in the hieroglyphs of Kauder. In the short time that I was at work I discovered certainly two of the characters what were in Kauder's work. Both of these are similar to, but not identical with, symbols of the Roman Catholic Church.

"It still remains undetermined whether those particular characters were imitated by Indians during the last two hundred years from religious symbols collected by Kauder, or whether those religious symbols had been adapted from some characters which had previously been in use. A more extensive examination and study of the characters on the rocks, of which probably there are thousands that I did not copy, or indeed carefully examine, would be necessary before it could be determined to verify my hypothesis that the scratching of symbols on these rocks would be explanatory of the Micmac printed hieroglyphs.

"On one point the peculiar multiplication of the characters affords an index to antiquity beyond what is generally possible. The existence of two or three different sets of markings, all visible, and of different degrees of distinctness, is in itself important; but, in addition to that, it is frequently the case that the second and third in the order of time have associated with them dates, from which the relative antiquity of the faintest and dateless can be to some extent estimated. The third and most recent class of dates are English names, and are associated with the forms of English letters; the second class are French names, and in some cases have French designs.

"There is an interesting story on this subject which was communicated to me from Louis Labrador, whose great-grandfather, old Ledore, according to his account, piloted a body of French Acadians, who, at the time of the expulsion in 1756, were not shipped off with the majority. They escaped the English, and travelled from the valley of Annapolis to Shelbourne, at the extreme south-east of the peninsula, and were on their way from May to October. During that passage they halted for a considerable time to recruit in this beautiful valley along the Kejimkoojik Lake, the very spot where these markings appear, and which was on the ancient Indian trail. It is exceedingly probable that the French would have been attracted to scratch on these fascinating smooth slate surfaces whether or not they had observed previous markings, but it seems evident that they did scratch over such previous markings. Therefore the latter antedated the middle of the eighteenth century.

"One of the printed impressions taken in the manner before mentioned is of a bat between an armed brig and troops or Indians on land, which might have been one of the several naval expeditions against the Acadians; as, for instance, that of Argall in 1614, or Cromwell's of 1654, and which was etched as of historical interest by the French wanderers at the time mentioned. The rig of the vessel has not been used for at least a century, and the 'top' where men are shooting at those on shore reminds of the old sea-fights under the Stuarts. The artist has drawn his brig down to the keel without reference to the displacement of water or to perspective, and afterwards superposed the shore-line and its defenders.

"The other impressions, copied on linen, and presented to show the character of the work on the rocks, but by no means its intrinsic value, are a peculiarly drawn star appearing many times in Kauder's book, though five-pointed instead of seven, — a dragon-fly with some fainter characters. A grotesque group — probably a French caricature — is two eels, and two birds perhaps intended for herons.

"Other impressions taken by me on paper, and mounted on cardboard, show a small star of the same character as before given, but five-pointed, some faint designs resembling those of Kauder but not identical, an animal supposed to be a bear, an aboriginal head and bust, a very artistic moose, and a cluster of three trees differentiated at their roots, and conjectured, by comparison with a Passamaquoddy inscription, to signify the first, second, and third chiefs of the tribe.

"In connection with the scratchings on the soft and polished surface of the rock, which seems to invite them, the thought occurs that the art of picturing, and subsequently of writing, is in all parts of the world determined by the ready and convenient material; as, for instance, the papyrus of the Egyptian, and parchments in other parts of the ancient world; the hides of deer or buffalo among the hunting tribes of this country. But the most tempting and convenient of all material appears to have been the birch-bark, which is found generally through the whole of the northern Algonkin region. This can be used in two entirely distinct modes, — one in which outlines are drawn by any hard-pointed substance on the inner side of the bark when it is soft, and which remains indelibly when dry; the other made by scraping on the rougher outer surface, thus producing a difference in color."

The New Naval Observatory.

The contract for the erection of the new Naval Observatory buildings, on Georgetown Heights, near Washington, has been awarded by the secretary of the navy for $307,811. This contract does not cover the piers or the domes, which are to be built by experts under the direct supervision of the observatory officers. There are to be nine buildings in all, including the main building; the great equatorial building, where the great telescope will be mounted; the clock-room, where the observatory clock will be set up and the naval chronometers kept and corrected; two buildings for observers' rooms; the east and west transit buildings; and a boiler-house. The material used will be Tuckahoe marble. Work is to be begun immediately, and the buildings are to be completed within eighteen months.

ELECTRICAL SCIENCE.

Electric Launches.

MR. RECKENZAUN, of the Electric Accumulator Company, has fitted up a small launch, to be run by an electro-motor supplied with electricity from secondary batteries. The launch has no features of especial novelty, excepting the fact that it is the first boat propelled by stored electricity that has been used in this country. A full charge of the battery will take her about eighty miles; and she can be more easily controlled than an ordinary launch, besides being noiseless, and free from heat and dirt. In speed, weight, and the distance she can go, she compares favorably with steam-launches of the same size, while in point of comfort she would far surpass them. There is a field for these boats at present on men-of-war for general use, or for torpedo-boats, for which last purpose their noiselessness makes them especially valuable. They could

be used, too, on larger yachts, and for pleasure-boats by those who can afford them, and where there are facilities for reaching the battery. An important use just at present is to call attention to the possibilities of storage-batteries, and to encourage inventors to improve the present uneconomical and weighty types.

The launch in question is twenty-eight feet long, has six feet beam and a depth of three feet. The batteries are under a couple of benches running fore and aft. The motors are under the deck aft. The motors are governed by a handle near the steering-wheel. With seven-horse power the boat is said to make twelve miles, with two-horse power about six miles, an hour.

COST OF ELECTRIC TRACTION. — The following table is the result of calculations made by experts on the cost of horses, cables, and electric storage-cars on the Fourth Avenue street-car line, New York: —

	Electric.	Horse.	Cable.
Cost of cars	1	.54	.81
Motive power	1	1.45	1.06
Construction of roadway	1	.53	2.09
Depreciation and repairs	1	1.47	2.04
Operating expenses (including wages)	1	3.38	1.71
Total	5	7.37	7.71
Average	1	1.47	1.55

For this road, then, storage-cars would, provided the estimate be correct, be much cheaper than any other system. Fortunately, these figures will have a practical test, since the Julien Company is equipping ten storage-cars for the line. So much for storage-cars. Where overhead wires are permissible, there seems no doubt of the advantages of electric traction. The Union Passenger Railway in Richmond, with the Sprague system, is carrying over 250,000 passengers a month, at a cost of less than 1½ cents a car-mile; the total operating expenses, every thing included, being only 47 per cent of the receipts. What electric railway systems using a conduit between the tracks for their conductor can do, remains to be seen. For haulage in mines, the reports are most encouraging. Mr. Shaefer, at a meeting of the Engineers' Club of Philadelphia, stated that the cost per ton-mile in the anthracite-coal mines was as follows: mules, 1.82 cents; steam, .6 cent; electric motors, .4 to .67 cent. Considering the very obvious advantages of electricity as compared with steam in mining-work, the figures are strongly in favor of electricity for traction in mines. Outside of cost, electricity presents the advantages of cleanliness and perfect control; and the above figures, taken in two cases from actual and continued experience, show, that, when properly applied, it is superior in economy as well.

LIGHTNING-FLASHES. — W. Kohlrausch has estimated the current and quantity of electricity in a lightning-flash. He calculates that it will take 9,200 ampères to melt a copper rod of 2.5 centimetres diameter. Such a current concentrated in a flash would contain from 52 to 270 coulombs, which would decompose from 5 to 25 milligrams of water, and form 9 to 45 cubic centimetres of explosive gas. If this energy were stored up and distributed for electric-lighting, it would require from 7 to 35 flashes to keep one incandescent lamp lighted for an hour.

AN ELECTRO-CHEMICAL RADIOPHONE. — The *London Electrician* gives an abstract of a communication to the Académie des Sciences by MM. Chaperon and Mercadier, describing a galvanic cell made by them which is sensitive to the action of light. "It consists of a plate of bright silver covered by the electrolysis of sulphate of sodium with a thin layer of sulphide of silver, immersed in some electrolyte other than an alkaline sulphide, water containing a trace of sulphuric acid being as good as any thing. The electro-motive force is feeble and variable, and the cell polarizes rapidly, but its current undergoes an instantaneous change when exposed to daylight or even to weak artificial light. The authors investigated the rapidity of action by exposing the cell to the beam of the oxyhydrogen light, made intermittent by passing through a revolving wheel pierced with holes. A telephone was included in the battery circuit, and sounds were produced so high in the scale as to correspond to more than 1,000 vibrations a second, which showed that the electro-chemical effect must be produced in less than $\frac{1}{2000}$ of a second. No corresponding change was produced in the resistance of the cell: so the effect of the light must be to cause a variation in the electro-motive force.

EXPERIMENTS ON THE ELECTRIC ARC. — The fall of potential in the electric arc has been generally held to be due to two causes, — a resistance increasing with the length of the arc, and a counter electro-motive force independent of the length. This may be expressed by the formula $E = a + bl$, where a and b are constants, and l is the length of the arc. Dr. Lecher, in a paper in the *Centralblatt für Electrotechnik*, describes experiments which tend to disprove this view. He first found that the resistance of the arc does not increase very rapidly when it is extinguished: this he showed by putting the primary of an induction-coil in the arc-lamp circuit, first pulling the carbons apart, and second extinguishing the lamp. There was a spark in the secondary in the first case, but not in the second: so the resistance, on extinction, could not have increased with very great rapidity. This being the case, Dr. Lecher placed in the lamp-circuit a galvanometer, the needle held against a stop for the direct current, but free to swing in the opposite direction. He then suddenly cut out the feeding-current, and there was no swing of the galvanometer-needle in the opposite direction: so, if there was a counter electro-motive force in the arc, it must have disappeared at the same time the feeding-current ceased. To see if the difference of potential of the arc depends on the temperature of the carbons, they were heated by a blowpipe. With a normal difference of 42 volts, this rose to 48 volts when the positive, and 52 volts when the negative, carbon was heated. When the carbons are horizontal, the potential difference is less than when they are vertical, on account of the higher temperature in the latter case. When the carbons are cooled, the potential difference is less. For example, representing the difference by $a + bl$,

	a	bl	
Carbons horizontal, uncooled	33	$4.5l$	±1.5 volts.
" vertical, "	35.5	$5.7l$	±1.5 "
" horizontal, cooled	25	$5.0l$	±3.0 "

To find in what part of the arc the fall of potential really occurred, a carbon rod of small diameter was introduced into the arc, and the difference of potential between it and the carbon electrodes was taken. It was found that the difference of potential between the +carbon and *any* part of the arc was about 36 volts. This being the case, it is assumed that the rest of the fall of potential is at the —carbon. Dr. Lecher also experimented on the nature of the current forming the arc, but the method used is questionable. He claims that his investigations show: 1. The existence of a back electro-motive force is doubtful; 2. The difference of potential is affected by temperature; 3. If the negative electrode is platinum or iron, the discharge is discontinuous.

THE RADIO-MICROPHONE. — Mr. C. Vernon Boys has described before the Royal Society an instrument for measuring very small changes of temperature. "It is an extremely delicate form of thermopile, consisting of a square frame made of one turn of one square centimetre, of which three sides are thin copper wire, and the fourth is a compound bar of antimony and bismuth, each piece being $5 \times 5 \times \frac{1}{6}$ mm., soldered edge to edge. This frame is supported by a thin rod to which is fastened a mirror, and the whole is hung by a tortion fibre in the field of a powerful magnet. When radient energy falls on the centre of the compound bar, the frame is deflected, and the amount of deflection measures the energy. Adopting suitable dimensions, and using a very strong field, an instrument may be made capable of showing a change of temperature of the junction of one thousand-millionth of a degree."

BOOK-REVIEWS.

Forms of Animal Life, a Manual of Comparative Anatomy. By GEORGE ROLLESTON. 2d ed., revised by W. Hatchett Jackson. Oxford, Clarendon Pr. 8°. (New York, Macmillan, $9.)

THOSE who in years past have been familiar with Rolleston's 'Forms of Animal Life' will welcome the very much enlarged and modernized edition that makes its appearance after a lapse of seventeen years. Opinions may and will differ as to how the principles of comparative anatomy are best taught, but no one will deny

that he will be well taught who follows this bulky manual faithfully through. The work has been thoroughly revised, largely rewritten, and very much increased in size, by Professor Rolleston's collaborator and successor, Mr. W. H. Jackson. For the benefit of those who are not familiar with the former edition (and there are comparatively few students in recent years in America who are familiar with it), a few words relative to the scope of the volume may be given. The first part of the volume is essentially a laboratory guide, illustrated by plates, of the anatomy of various selected types of animal structure; the second and larger part contains systematic morphological descriptions of the classes and higher divisions of the animal kingdom, with briefer discussions of the different orders, both fossil and recent. The descriptions are very comprehensive, essentially comparative, and modern. Not the least valuable part of the work are the bibliographies appended, in both parts, to type or class, and so arranged as to open up to the student special lines of study in any direction he may select.

The work is alike valuable to the special student and teacher of comparative anatomy, and will be scarcely less useful to the paleontologist and college teacher of zoölogy, as well as forming an excellent adjunct and continuation to Huxley and Martin. To the undergraduate, or even non-specialist post-graduate, almost its only service will be that of a work of reference. As Professor Rolleston says, the distinctive character of the book "consists in its attempting to so combine the concrete facts of zoötomy with the outlines of systematic classification as to enable the student to put them for himself into the natural relations of foundation and superstructure." But no student can appreciate or grasp the broad morphological principles underlying classification until he has first familiarized himself with the details upon which those principles are based. In Huxley and Martin's 'Biology' the other extreme is taken, and facts, only, presented; in the present work we believe that a much more thorough acquaintance with the actual structure of animal bodies is needed than is presented in the first part, before the student can avail himself of the more systematic morphological portion. The work is not complete in itself: it needs and will be supplemented by others; nevertheless it is one that no zoötomist or zoölogist can afford to be without.

A Course of Elementary Instruction in Practical Biology. By T. H. HUXLEY. Revised and edited by G. B. Howes and D. H. Scott. London and New York, Macmillan. 16°. $2.60.

HUXLEY and Martin's 'Practical Biology' has long since won an enviable place as a text-book in our best institutions, and the present edition contains many important improvements that will meet the approbation of teachers. In size, the present is nearly twice that of the former edition, and its arrangement has been materially changed. Especially do we approve of the principle, that has already been accepted by other authors in similar treatises, of starting the student in on work that is more familiar to him, and gradually leading him to less familiar fields, rather than the adherence to a more logical and systematic but less practical view of living structure. In the present edition the arrangement has been so changed that the student is first taken through a careful study of the frog, and then follows successively the study of the cray-fish, earth-worm, snail, mussel, polyps, animalcules, yeast, protococcus *Spirogyra*, bacteria, moulds, stoneworts, fern, and bean. Even with the present arrangement, we believe that the student's interest would be sharpened, and his skill increased, by a preliminary study of the best-known and most familiar of all structures, the human body. The portion devoted to the frog has been most largely increased; and the additions of the earth-worm, snail, and *Spirogyra* add to the value of the book. The appendix is a happy addition to the work, and is a good, fresh, and succinct account of microscopic material and technique.

The work is undoubtedly accurate: the authors' names are not needed as a guaranty of this. The omission of figures and plates is objectionable to some; but the true use of the work, that of a guide to the student in the examination of specimens for himself, neither requires nor desires such. It is too advanced for the general undergraduate student, but is excellent for post-graduate work in preparation for medical studies. Some day, though we fear it may be far in the future, such preliminary work as this will be required of all medical students: it would go far towards mitigating the very just opprobrium under which most medical colleges of our country now suffer, — that of being the most unscientific of all scientific schools. The work would be improved by a more comparative morphological treatment. But little is said of the general principles underlying structure, and the relations of the general types are not made apparent, as they should be.

A Popular Zoölogy. By J. DORMAN STEELE and J. W. P. JENKS. New York and Chicago, Barnes. 12°. $1.40.

First Lessons in Zoölogy. By A. S. PACKARD. 2d ed. New York, Holt. 12°. $1.

BOTH of the above text-books are by well-known authors, coming simultaneously from Brown University, and both are worthy of commendation; but both are not of like merit in all respects, nor adapted for the same class of pupils. Steele and Jenks's book is designed to interest and instruct; Packard's, to instruct and interest. The former is more elementary and popular; the latter, for a somewhat older grade of pupils, and is more scientific. The one deals with the familiar forms of life more fully, — there is an undue amount on birds, — and is rather too much after the style of Tenney; Packard's work is more philosophical, and treats of principles rather than of details.

If is very difficult in a text-book on zoölogy, especially one intended for young pupils, to hit the happy mean between meaningless details and a dry, uninteresting compendium of comparative anatomy. Furthermore, the value of an elementary zoölogy depends upon who the teacher is. If he is, as is too often the case, one who knows as much about the principles of zoölogy as he does of those of the Aztec language, then no book will be of much value; if he is a good zoölogist himself, he does not rely very exclusively upon any text-book. For the pupil who must depend largely upon himself, Steele and Jenks's book, with its numerous good illustrations and anecdotal style, can be recommended; but, for the more scientific yet interesting application of the principles of animal life and its classification by a qualified teacher, the excellency of Packard's work cannot be gainsaid. The additions in the present edition of the last work are confined to the *Insecta*, *Ctenophores*, and the horseshoe crab.

NOTES AND NEWS.

IN 1887 an association was formed in Ireland for the promotion of silk-culture in the south of the island. The hope was to utilize land now devoted to very unproductive crops. The Journal of the Society of Arts states that the river-valleys of Munster are especially suited for the growth of the mulberry-tree. The present effort to introduce silk-cultivation divides itself into two parts, — first the cultivation of the mulberry-tree, and next the rearing of cocoons. To accomplish these objects of the association it is proposed, and is actually being done on a small scale, to distribute mulberry-trees among those who last year reared such silk as to "equal any Italian or other silk." Count Dandalo, in his Italian work on the silkworm, says that Ireland, from many circumstances, appears peculiarly favorable to the cultivation of silk. The experiment of rearing silkworms is being tried by about thirty families, but large results are not expected at once, as the imported mulberry-trees will not leaf well in the first year. It is remarked, that, if the re-afforesting of Ireland be desirable, some of the trees should be the useful mulberry. Another part of the scheme is to introduce reeling-machines, which can be used by ladies in their own homes. Sericulture has been in every country rather an occupation for the family than for the factory, which gives it a special claim to attention, at a time when those whose circumstances forbid them from seeking employment outside their own homes are suffering keenly from the general depression.

— The Society of Science of Harlem has just published Volume I. of the works of the illustrious Huygens. This is a volume which will be of special value to the physicists and historians, and we can but commend this republication of the works of the pioneers in science. The Physical Society of France has done a similar piece of service in republishing the works of Coulomb and Ampère.

— M. Wolf announced at the meeting in the French Academy, June 11, that Captain Dfforges had discovered in the archives of the Ecole des Ponts et Chaussées a number of notes by Prony which show him to have been the discoverer of the modern methods of determining the force of gravity. In 1792 Prony proposed to substitute for the simple pendulum a rod oscillating successively on three parallel knife-edges. Later, in 1800, the study of his first apparatus led him to a contrivance which was nothing less than the reversion-pendulum proposed in 1811 by Bohnenberger, and applied for the first time by Captain Kater in 1817. Unfortunately the many professional occupations of Prony and his journeys did not permit him to make such a pendulum, and the memoir of 1800 was never published.

— An exhibition of hygiene opens at the Palace of Industry in Paris on the 20th of July. Another exhibition for the same purpose, also containing a section devoted to the fine arts and the industrial arts, opened at Ostend on the 30th of June.

— A recent number of the San Francisco *Bulletin* contains some facts as to the exhibition under the auspices of the California State Board of Silk Culture. "The exhibition is of a highly practical nature, and comprises, in addition to reels, filatures, and cocoons, over fifty thousand worms in different phases of development, a great number of which, however, have reached the spinning-stage, and are industriously engaged in the evolving of their costly product. The manager of the work, Mrs. Louise Rienzi, is an enthusiast in regard to sericulture, and is to be largely credited for the rapid progress made by the board during the two years it has been established. The impetus given to sericulture in California by the labors of the board has pushed the industry forward vastly. Large invoices of cocoons are daily received, besides considerable quantities of raw silk sent to be spun on the improved filature machinery imported from Italy for this purpose. Appropriately enough, the majority of those who have engaged in silk-culture in the State are ladies. Communications are received every day from those desirous of obtaining information necessary to the establishing of silk-farms. Besides being furnished with a book of instruction, all who apply may obtain eggs or worms in embryo, as well as mulberry leaves, trees, and cuttings. Fully sixteen thousand trees and cuttings were distributed last spring as food-supplies for the worms on silk-farms located at Dutch Flat, Paso Robles, Brentwood, Antioch, Howell Mountain, Sebastopol, Visalia, Santa Paula, Templeton, Chico, Rutherford, San José, Irvington, Danville, Anderson, Los Angeles, Eureka, San Bernardino, Fresno, Livermore, Bowlder Creek, and numerous other towns throughout the State. The leaves of one three-year-old tree are estimated to be sufficient for the nourishment of an entire colony of silkworms, while one hundred trees will supply the wants of as many worms as can be attended to in any but the largest establishments. The supply of trees and cuttings at the command of the board was exhausted early in the present season, but the many applications held over will be filled from the stock of fifty thousand trees which will be procured for next season.

— The *American Meteorological Journal*, desiring to direct the attention of students to tornadoes, in hopes that valuable results may be obtained, offers the following prizes: for the best original essay on tornadoes, or description of a tornado, two hundred dollars will be given; for the second best, fifty dollars; and among those worthy of special mention fifty dollars will be divided. The essays must be sent to either of the editors, Professor Harrington, Astronomical Observatory, Ann Arbor, Mich., or A. Lawrence Rotch, Blue Hill Meteorological Observatory, Readville, Mass., U.S.A., before the first day of July, 1889. They must be signed by a *nom de plume*, and be accompanied by a sealed envelope addressed with same *nom de plume*, and enclosing the real name and address of the author. Three independent and capable judges will be selected to award the prizes; and the papers receiving them will be the property of the journal offering the prizes. A circular giving fuller details can be obtained by application to Professor Harrington.

— At the meeting of the Engineers' Club of Philadelphia on June 16 it was voted that the club join in the invitation, which had been extended by other societies, to the International Congress of Geologists, to hold its fifth session, in 1891, in the city of Philadelphia.

— In his article in a recent number of *The Forum*, Professor Thurston takes occasion to remark that the world is awaiting the appearance of three inventors greater than any who have gone before, and to whom it will accord honors and emoluments far exceeding all ever yet received by any of their predecessors. The first is he who will show us how, by the combustion of fuel, directly to produce the electric current; the second is the man who will teach us to reproduce the beautiful light of the glow-worm and the firefly, a light without heat, the production of which means the utilization of energy without a waste still more serious than the thermo-dynamic waste; while the third is the inventor who is to give us the first practically successful air-ship.

— The Manhattan Chapter, New York, of the Agassiz Association, held a silk exhibition at 103 Lexington Avenue, commencing Friday evening, June 29, at 8 P.M., with a lecture on silk by C. F. Groth, and continuing Saturday, June 30, from 3 to 10 P.M.; Sunday, July 1, from 3 to 10 P.M.; and Monday, July 2, from 3 to 10 P.M.

— Prof. H. P. Bowditch has made an important contribution to the growing literature of the 'knee-jerk' phenomenon, the importance of which as an index of nervous condition is now so widely recognized. Using an apparatus that allows the force of the blow and the extent of the excursion to be recorded, he asks the subject to firmly clinch the hand (and thus re-enforce the knee-jerk) upon a given signal. After an interval varying from .1 of a second to 1.7 seconds, the blow is struck, and it is found that the effect of the re-enforcement varies with the interval. It is greatest immediately after the hand is clinched, and with an interval of .4 of a second has disappeared. With an interval of .4 of a second to 1 second, there is a diminution of the knee-jerk, followed by an increase, reaching the normal again at 1.7 seconds. There is thus a short period of exaltation, followed by a depression and a slow return to the normal.

— A paragraph is going the rounds of the press, with what truth we know not, to the effect that a company was recently started in Philadelphia for the purpose of investigating the pyramids of Egypt by boring into them with diamond drills, thereby penetrating into some of the mysteries which have so successfully baffled the investigators of centuries.

— The observations of M. Perrotin at Nice, and M. Terby at Louvain, and, in England, of Mr. Denning at Bristol, have confirmed, according to *Nature*, the presence on the planet Mars of most of the 'canals' or narrow dark lines which were discovered by M. Schiaparelli in 1877, and at subsequent oppositions. M. Perrotin has also been able to detect, in several cases, the gemination or doubling of the canals, and M. Terby has observed the same phenomenon in one or two cases, but with much greater difficulty than in the opposition of 1881–82. But some curious changes of appearance have been noted. An entire district (Schiaparelli's *Lybia*) has been merged in the adjoining 'sea;' i.e., its color has changed from the reddish hue of the Martial 'continents' to the sombre tint of the 'seas.' The district in question is larger than France. To the north of this district a new canal has become visible, and again another new canal has appeared to traverse the white north polar cap, or, according to M. Terby, to divide the true polar cap from a white spot of similar appearance a little to the south of it. With the exception of these changes, the principal markings, both light and dark, are those which former oppositions have rendered familiar.

— We learn from *Nature* that admirable arrangements have been made for the London meeting of the International Geological Congress, from Sept. 17 to 22 next. The meetings will be held in the rooms of the University of London, Burlington Gardens, where accommodation for the council, committees, exhibition, etc., has been granted by the senate of the university. There is a refreshment-room in the building, and there are several restaurants and hotels in the immediate neighborhood. Arrangements will be made at one of these restaurants for a room to be set apart for the social meetings of members of the congress. The opening meet-

ing of the congress will take place on Monday evening, Sept. 17, at 8 P.M., when the council will be appointed, and the general order of business for the session will be determined. The ordinary meetings of the congress will be held on the mornings of Tuesday, the 18th, and succeeding days, beginning at 10 A.M. In the afternoons there will be visits to museums, or to places of interest in the neighborhood of London. Arrangements for the evenings will be made at a later date. The ordinary business of the congress will include the discussion of questions not considered at Berlin, or adjourned thence for fuller discussion at the London meeting. Among these are the geological map of Europe, the classification of the Cambrian and Silurian rocks and of the Tertiary strata, and some points of nomenclature, etc., referred to the congress by the International Commission. Miscellaneous business will also be considered. In addition to these questions, the organizing committee proposes to devote a special sitting to a discussion on the crystalline schists. An exhibition will be held during the week of the congress, to which geologists are invited to send maps, recent memoirs, rocks, fossils, etc. Foreign members of the congress are invited by the council of the British Association to attend the meeting of that association at Bath. During the week when the association meets, there will be short excursions in the neighborhood of Bath, and longer excursions will be made after the meeting. At these excursions excellent sections of the lower secondary and upper paleozoic rocks will be visited. Excursions will take place in the week after the meeting of the congress (Sept. 24 to 30). The number of these will depend upon the number of members desirous of attending, and upon the districts which they most wish to visit. The excursions at present suggested are: (1) The Isle of Wight (visiting the Ordnance Survey Office at Southampton on the way), cretaceous, eocene, oligocene. (2) North Wales, Pre-Cambrian and the older paleozoic rocks; West Yorkshire (Ingleborough, etc.), Silurian and carboniferous limestone. (3) East Yorkshire (Scarborough, Whitby, etc.), Jurassic and cretaceous. Should the number of members be so large as to make additional excursions necessary, they will probably be: (4) Norfolk and Suffolk, pliocene (crag) and glacial beds. (5) To the Jurassic rocks of central England. The short excursions during the week of the congress will probably be to Windsor and Eton, to St. Albans, to Watford, to Brighton, to the Royal Gardens at Kew, and to other places of interest. Brief descriptions of the districts to be visited in these excursions will be prepared (with illustrative sections, etc.), and will, if possible, be sent to members before the meeting. The full report of the London meeting will be issued soon after the close of the session. It will contain, in addition to reports of the ordinary business of the congress, the report of the American committee on nomenclature (about 230 pages); the memoirs on the crystalline schists (about 150 pages), and reports of discussion on the same; and probably a reprint, with additions, of the report of the English committee on nomenclature (about 150 pages).

— An international horticultural exhibition, we learn from *Nature*, is to be held at Cologne from Aug. 4 to Sept. 19.

— On the 4th of June, according to *Nature*, Dr. Maxwell T. Masters was elected a corresponding member of the Institute of France, in the Botanical Section, in place of the late Prof. Asa Gray. Besides Dr. Masters, the following names appeared on the list of presentation: M. Treub of Batavia, Mr. Triana of Paris, M. Warming of Lund, M. Wiesener of Vienna. Dr. Masters obtained 39 votes; M. Triana, 5; M. Treub, 1.

— We are glad to learn (from *Nature*) that a pension of £50 has been granted to Mrs. Balfour Stewart from the civil list.

— Messrs. Thomas Whittaker & Sons, New York, have published an admirable 'Planisphere showing the Principal Stars visible for Every Hour in the Year.' It is substantially made, and convenient for use in our latitude. —— *Outing* for July opens with 'An Irish Outing Awheel,' from the pen of 'Faed' Wilson. The illustrations of Irish scenery by Harry Fenn are handsomely reproduced. The number contains plenty of summer matter. Samuel M. Baylis is the author of 'After Trout in Canadian Waters.' Other articles are 'Richfield Springs,' by Mrs. M. B. Hedges; 'The Angling Tournament,' by Francis Endicott; etc. —— The July volumes of Ticknor's Paper Series will be as follows: 'Two College Girls,' by Helen Dawes Brown, ready July 7; and 'The Rise of Silas Lapham,' by William D. Howells, ready July 21. —— Macmillan & Co. are about to publish in two volumes a second series of Carlyle's letters, extending from 1826 to 1835, edited by Professor Norton. —— The J. B. Lippincott Company have in press 'Stanley to the Rescue: the Relief of Emin Pacha,' by A. Wauters, president of the Royal Geographical Society of Belgium. It will contain a map and thirty-four illustrations. —— G. P. Putnam's Sons publish this week 'The Story of Turkey,' by Stanley Lane-Poole, which forms the nineteenth volume of the story of the Nations Series.

— Mr. Joseph Jastrow has been elected professor of experimental and comparative psychology at the University of Wisconsin. This is very gratifying, as it shows an interest in this country in the scientific aspect of mind.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

The Rainfall at Fort Leavenworth, Kan.

IN 1837 rainfall observations were instituted at Fort Leavenworth under the supervision of the post surgeon, and the record was continued, with but few breaks, until October, 1883. In the latter year, in view of the proximity of the Signal Service station in Leavenworth City, the authorities at the War Department, or the officers at the fort, suffered this magnificent record to be discontinued. The length of the series, surpassing any other record west of the Mississippi, and antedating by almost twenty years the settlement of Kansas by the white man, has made it of especial value as evidence upon the question of a secular change in rainfall over the Western plains.

The observations up to 1874 were rendered generally available by their publication in the 'Smithsonian Precipitation Tables' and in the 'Report of the Kansas Board of Agriculture for 1874;' for the years 1871 to 1880 they were published in 'Professional Paper No. IX.' of the Signal Service; and for 1881 to 1883 they have not been printed, or at least have not become generally accessible. The series subsequent to 1873 seems, moreover, to have been little used, and discussions of secular change in rainfall have generally been made by completing the Fort Leavenworth series since 1873 with the Signal Service records at Leavenworth City, the entire comparability of the two series being assumed without investigation or proof.

That this assumption is quite unscientific, and that it is liable to lead to erroneous results, does not need to be argued before the careful meteorologist. The difference in the rules and methods of observation and the spirit of the observers, as well as the difference in the locations and exposures of the gauges and in the gauges themselves, furnish abundant room for systematic discrepancy.

With the record thus constructed out of the two series of observations, an average increase of seven inches seemed to have occurred during the past twenty years, and this result has been widely used to confirm the belief in a permanent increase in the rainfall over the Western plains. For the reasons above stated, this conclusion seems to me to stand in need of a complete re-examination. In a preliminary survey of the Fort Leavenworth observations as printed, errors were discovered that showed the necessity of a thorough scrutiny of the original data (see *Science*, xi. No. 272).

In order to make the desired examination, I have visited Fort Leavenworth, and through the courtesy of Major Alfred A. Woodhull, Surgeon U.S.A., was enabled to make copies of the original records for the years not hitherto published, and for the periods needing confirmation. I am also indebted to Major Woodhull for certified copies of a portion of the records that have heretofore been incorrectly printed.

In view of the error already discovered, — namely, that the measured snowfall in January, 1871, had not been reduced to inches of

water, — I examined all of the data since 1870, to correct, so far as possible, all other errors of the same kind. The record of snow for the winters of 1870–71 and 1871–72 were found to be given in this way, and comparison with the Signal Service observations also indicated that the reduction had been neglected in a few instances in subsequent years. This critical examination of the original observations has led to the construction of the accompanying table of monthly totals: —

MONTHLY PRECIPITATION AT FORT LEAVENWORTH, KAN.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1870.....	—	—	—	—	—	—	—	—	—	—	—	1.27*	41.70
1871.....	1.12	3.37	1.70*	1.22	2.00	5.44	1.63	4.66	1.85	4.00	3.94†	0.46	31.39
1872.....	0.20	0.87†	2.30	4.50	8.15	3.64	9.99†	6.83	4.05	0.83	0.00	2.85	44.21
1873.	0.98	1.35	1.80	4.30	5.03	3 11	3.12	1.40	2.53	0.91	0.87	5.24†	30.64
1874.....	1.44	1.07	1.50	1.40	1.00	3.55	2.95	1.69	4.76	0.37	3.46†	1.02	24.21
1875.....	0.05	1.25†	1.70	2.23	4.17	2.34	6.72	3.15	0.78	0.74	0.40	1.98	25.51
1876.....	1.20	0.44	5.71	6.19	6 17	4.81	2.28	4.21	3.62	3.00	1.91	0.66	40.20
1877.....	1.65	0.58	4.14	5.16	7.61	7.59	4.36	2.15	1.88	4.36	1.71	2.82	44.01
1878.....	1.36	2.88	1.95	2.76	3.96	4.36	1 89	2 38	2.61	0.54	2 28	2 40	29.37
1879.....	0.12	0.35	0.06	3.44	2.05	7.89	3.59	0.62	2.79	3.85	6.26	1.85	32.87
1880.....	2.14	1.55	2.53	1.46	3.90	0.96	5.86	6.68	1 68	2.40	1.80	0.40†	31.36
1881	0.15	4.61	2.20	1.67	3.14	3 73	2.00	1.92	5.23	4.46	1.40	0.96	31.47
1882.....	1.07	0.88	0.76	3.84	2.61	2.82	3.00	0.65	1.18	2.28	1.92	1.06	22.07
1883.....	0.48	2.05	0.72	1.27	6.65	12 16	2.25	1.97	0.85	8.31†	2.02†	0.65†	39 38

* Observations by Mr. F. Hawn. † Observations by Signal Service.

Important changes in the values for April, May, July, and August, 1871, are corrections of serious errors existing in the published observations, the corrected values having been furnished by Major Woodhull. For those months in which the record at the fort is missing, namely, February and July, 1872, and October to December, 1883, the Signal Service observations have been inserted to complete the series.

The Signal Service record has also been substituted in November, 1871, and December, 1880, — months in which the fort record is manifestly recorded improperly, but for which the correct record cannot safely be inferred; and also in December, 1873, November, 1874, and February, 1875, for portions of which the fort record of snow is apparently measured carelessly, or recorded without reduction, but of whose error the evidence now at hand is not entirely conclusive.

Although in these several instances the fort record has been completed by the use of Signal Service observations, the series still remains essentially homogeneous and comparable from 1837 to 1883.

Combining the whole series in ten-year means, we have the material for ascertaining the existence of any secular change: —

Period.	No. of Years.	Amount.
1837-46.....	10	30.4
1847-56..... ..	10	32.3
1857-65.....	9	33.7
1867-76	10	33.2
1877-83.....	7	32.9

The increase of seven inches shown by the combined Fort Leavenworth and Signal Service records has largely disappeared. Examining, now, the average annual rainfall from 1872 to 1883 given by the Signal Service record and the record at the fort, we find that the former is 38.5 inches, and the latter 33.0 inches, showing a discrepancy between the two of five and a half inches.

To what this discrepancy is due, — whether to differences in the rules of observation or to an error of ten per cent in the Signal Service gauge (as was the case at Providence, R.I.), or to some other cause, — I do not know; but it is fairly manifest that the conclusions based on the assumed comparability of the two series are quite worthless.

GEO. E. CURTIS.

Birmingham, Conn., June 30.

Photographs of Lightning-Flashes.

POSSIBLY some of your readers may be interested in the following report: —

In the month of June, 1887, a committee of the Royal Meteorological Society, London, issued about two hundred circulars to the secretaries of photographic societies in various parts of Europe and America, and also to other likely persons, requesting them to furnish the society with photographs of lightning-flashes.

About sixty photographs of lightning-flashes were received in answer to this invitation; and these were exhibited at the meeting of the society in March, 1888, where they received much attention.

From the evidence now obtained, it is evident that lightning assumes various typical forms, under conditions which are at present unknown.

The following appear to be some of the most typical forms of lightning-flashes: —

1. Stream lightning, or a plain, broad, rather smooth streak of light. Only two or three specimens of this form have been received. The committee are disposed to consider this a distinct type of a single stream-like character, without distinct irregularities or branches, and not merely the result of bad focusing, because other objects, such as trees, are extremely sharp.

2. Sinuous lightning, when the flash keeps in some one general direction, but the line is sinuous, bending from side to side in a very irregular manner. This is by far the commonest type.

It is very noticeable that the thickness of the line varies during the course of discharge. Sometimes the thinnest part of the white streak is the highest, and the flash appears to get thicker as it approaches the earth; at other times a flash in the air begins thin, broadens out in the middle, and fines away again at the farther extremity.

The committee can offer no explanation of this at present, but they would call attention to the fact, that, in some photographs of electric sparks taken from an induction-coil, those of high tension are thinner than those of low tension.

3. Ramified lightning, in which part of the flash appears to branch off from the main streak like the fibres from the root of a tree. Of course, there is no evidence as to whether these fibres branch off from, or run into, the main flash.

4. Meandering lightning. Sometimes the flash appears to meander about in the air without any definite course, and forms small, irregular loops. The thickness of the same flash may vary considerably in different parts of the course, as mentioned above; and a flash may go pretty straight in one portion of its path, but meander considerably in another.

5. Beaded or chapleted lightning. Sometimes a series of bright beads appear in the general white streak of lightning on the photographic plate. Occasionally these brighter spots appear to coincide with bends in a meandering type, but often the beads appear without any evident looping of the flash.

But as a flash is moving in space, while two directions only can be shown on the plane of the paper, there is every reason to believe that the brighter spots on the positive picture may be points where the flash was zigzagging, either directly towards, or away from, the observer, and thereby giving a somewhat longer exposure to these spots.

6. Ribbon lightning. Nearly one-sixth of the photographs received by the society show flashes exhibiting more or less of a ribbon-like form. One edge of the ribbon is usually much whiter and firmer than the other.

Occasionally in the same picture some flashes appear normal, and others ribboned; but the flashes in a picture need not have occurred simultaneously. The committee have not yet in their possession any conclusive evidence as to whether the same flash may be normal in one portion, and ribboned in another portion, of its course.

In one picture there is a bright streak on the top of the flash; then about an eighth of an inch of ribbon-like light, the folds fol-

lowing the sinuosities of the bright streak; then a dark band, parallel to, and following, every irregularity of the bright streak; and then nearly another eighth of an inch of ribbon-like light. In another picture a very thin beaded flash has a precisely similar beaded streak, rather fainter than itself, running parallel to it, at a distance of about a sixteenth of an inch on the paper.

It might be suggested that the second fainter image was formed by internal reflection from the back surface of the glass plate; but it should be noticed that sometimes very thin flashes, which are not particularly bright, are so duplicated.

A far more probable cause is the double image formed by the internal reflections of doublet photographic lenses. All doublets are essentially two meniscus lenses, mounted with their concave surfaces facing one another. The greater portion of a strong point of light, passing through both lenses, forms the usual image on the plate; but a smaller portion is reflected from the concave surface of the rear meniscus on to the concave surface of the front lens, and from thence back through the rear lens to the sensitive plate. The amount of displacement depends on the angle formed between the direction of the bright point and the optical axis of the lens.

M. C. Moussette of Paris showed some photographs of the sun in which this double reflection image was very conspicuous; and there is not the slightest doubt that some lightning-flashes are bright enough to give this secondary image. M. Moussette also showed the photograph of a flash in which the centre of the flash was whitest, with a darker edge on either side. This may have been produced either by double reflection from the lens, or by internal reflection from the back of the glass plate. Two bands of light — the primary and secondary images — slightly overlapping would form an extra bright band where the overlap took place.

In the majority of cases, the folds of the ribbon formation are most obvious when the course of the flash is square to the width of the folds, and they are but slightly pronounced when in a line with them. This would suggest the idea of a shaking of the camera in the direction of the folds of the ribbon; but, if this is so, the duration of a lightning-flash must be much longer than is usually supposed.

The committee hope to have the opportunity of making some experiments on the photography of sparks from a coil or electrical influence machine. In the mean time they defer expressing an opinion as to whether lightning ever really takes a ribbon-like form till further evidence is available, but would point out that both sources of error — the duplication of the image either by reflection inside the lens, or by reflection from the back of the plate — would be avoided by the use of single lenses, and of paper instead of glass supported films. The committee also forbear for the present from publishing a reproduction of a ribbon-like flash, till they are satisfied that such a form of lightning really exists, and that the whole appearance is not due to photographic causes.

In one picture, sent by Mr. Shepherd, there are five ordinary white flashes, and one dark streak of precisely the same character as the bright streaks. M. Moussette has suggested that this may be the result of a very bright flash, so over-exposing the plate as to produce the well-known inversion of a negative by over-exposure, as when the ball of the sun appears black on the positive print, instead of white. This is no doubt a possible explanation; but the committee would like further examples of this same appearance of dark flashes before expressing an opinion on the matter.

The committee call attention to the fact that there is not the slightest evidence in the photographs of lightning-flashes of that angular zigzag or forked form so commonly seen in pictures.

In connection with this, they would call attention to a remarkable paper, communicated to the British Association in 1856, by James Nasmyth, F.R.S. Mr. Nasmyth says that he has never seen forked lightning of the angular zigzag form, and asserts that "the true natural form of a primitive flash of lightning appears to Mr. Nasmyth to be more correctly represented by an intensely crooked line, and on several occasions he has observed it to assume the forked or branched form, but never the zigzag dovetail."

The Council of the Royal Meteorological Society are desirous of obtaining more photographs of flashes of lightning, as they believe that a great deal of research on this subject can only be pursued by means of the camera, and would esteem it a great favor if any one would give them any assistance in this matter, either by sending them copies of any photographs of flashes of lightning that may have already been taken, or by endeavoring to procure them, or to interest others in so doing.

It may perhaps be well to mention that the photography of lightning does not present any particular difficulties. If a rapid plate, and an ordinary rapid lens with full aperture, be left uncovered for a short time at night during a thunder-storm, flashes of lightning will, after development, be found in some cases to have impressed themselves upon the plate. The only difficulty is the uncertainty whether any particular flash will happen to have been in the field of view. A rapid single lens is much more suitable than a rapid doublet; and it is believed that films on paper would effectually prevent reflection from the back.

The focus should be that for a distant object; and, if possible, some point of landscape should be included to give the position of the horizon. If the latter is impossible, then the top of the picture should be distinctly marked. Any additional information as to the time, direction in which the camera was pointed, and the state of the weather, would be very desirable. The council hope, now that the thunder-storm season is approaching, many photographers, both amateur and professional, may be found willing to take up this interesting branch of their art. A. F. N.

New York, July 2.

The Name of America.

WILL you permit us to correct some erroneous ideas in your note on our work? Your reviewer, referring to the origin of the name 'America,' says that our account derives it from a Peruvian tribe, although the name was in use long before Peru was discovered. This, no doubt, is an unintentional misrepresentation, as no such tribe ever existed, the name 'Peru' having been given by the Spaniards to the kingdom of the Aymaras of Aymaraca, whose subjects, according to some authors, were also the chief race in the West Indies. Your reviewer also wonders if the author ever knew that the Indies was the recognized Spanish name of the continent during the age of its discovery.

It seems to us incredible that any one could make such a remark, seeing that every schoolboy knows the story of the naming of the West Indies, while our work refers over and over again to the fact that the continent was officially known in Spain as the Indias, — a general term including the East and West Indies, which contained a large number of countries.

When a work bases a discovery on the evidence of standard authorities, the impartial critic who is not convinced will point out where the evidence is defective. This is the law of logic, which a scholar cannot ignore. But when an author who translates his original evidence from Italian, Spanish, French, German, and Latin, finds himself designated under the clownish epithets of 'half-learned wanderers,' 'happy enthusiasts,' 'erratic followers,' etc., we will leave it to the public to say whether that is an impartial, fair, or scholarly critique, or whether it does not look like the work of some little publisher, whose history — always for sale — tells another story.

The great Baron de Humboldt says that Amaraca-pana was the first Spanish settlement on the mainland. This was in 1502, five years before the pamphlet of St. Die proposed the name of 'Amerigo Vespucci,' who sailed into Amaraca-pana on his first visit, under command of Ojeda, to the New World, and which was the only place where they were favorably received, and treated as if they were angels. So says the royal Spanish historian Herrara, in quoting Ojeda himself; and the Isle of Tamaragua, on the first standard map of the continent, published in 1508, was evidently intended for Amaraca or America, which was long considered an isle. Here is positive evidence, by well-known authorities; and whoever is not convinced should point to evidence of a better explanation, or show cause why ours is insufficient; doing so in the language — to use your reviewer's own words — of a "sober historian." T. DE ST. BRIS.

New York, June 30.

[Our correspondent has evidently failed to read the review carefully. — ED.]